

FEATURE ARTICLE

Does Space Matter?

Assessing the Undergraduate “Lived Experience” to Enhance Learning

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Developing an understanding of the lived student experience in relation to physical space is critical in order for designers to create spaces that work for the mobile, fast-paced, and multifaceted lives of university students.

INTRODUCTION

IN THE LIVES OF STUDENTS, LEARNING IS SHAPED by experiences both inside and outside of the classroom. Yet primary research on student-user experiences outside of a classroom is limited, as is information on how non-classroom spaces such as libraries and learning commons impact the experiences of students. Developing an understanding of the lived student experience in relation to physical space is critical in order for designers to create spaces that work for the mobile, fast-paced, and multifaceted lives of university students. A user-oriented research collaboration between Georgia Institute of Technology (Georgia Tech) and Herman Miller, Inc.’s Insight and Exploration teams sought to further define the lived student experience. The research took place in the G. Wayne Clough Undergraduate Learning Commons, also known as the Clough (pronounced Cluff) Commons, at Georgia Tech’s campus in Atlanta.

BACKGROUND

HISTORY OF RESEARCH COLLABORATION

This research project is a continuation of an ongoing relationship between Georgia Tech and Herman Miller that began in 2005. Previous collaborations included user-

oriented research and engagement of the student advisory team at Library East Commons (LEC). The Clough Commons collaboration resulted in a unique research opportunity to observe how students interact with learning commons environments.

THE CLOUGH COMMONS

Named in honor of Georgia Tech President Emeritus G. Wayne Clough, the Clough Commons was developed in response to Georgia Tech’s growing student body with a special emphasis on supporting undergraduate academic needs. The guiding principle of the Clough Commons was to bring together all components of undergraduate learning in a centralized location, including classes, laboratories for first-year students, ubiquitous and flexible study spaces, and just-in-time tutoring, advising, and technology support services. The facility opened in August 2011 after a decade-long period of thoughtful student-centered conceptual design, prototyping, and construction; students were engaged in the facility planning discussions through a student advisory team. The facility is dedicated to undergraduate academic enrichment, innovative learning experiences, advances in teaching pedagogy, and the integration of technology into the classroom. It is also a showcase for sustainable building methods and operation; the facility received a LEED

(Leadership in Energy & Environmental Design) Platinum rating from the U.S. Green Building Council in 2013, making it one of 16 LEED-certified buildings on Georgia Tech's campus.

The Clough Commons is a 24-7, 220,000-square-foot, five-floor facility. (See the appendix for detailed plans of each floor.) It offers a Starbucks café open from 7:30 a.m. to 3:00 a.m. and ubiquitous Wi-Fi and electrical infrastructure (i.e., outlets). In addition to the academic support units housed in the building, the Clough Commons includes flexible SCALE-UP classrooms, breakout study rooms, first-year science labs, and, perhaps most important for students, over 700 seats of varied furniture styles and functions to accommodate a multimodal style of learning and interaction. The Commons spaces are varied in arrangement, furniture type, and design to accommodate the wide variety of use modes.

Although the Clough Commons provides academic support geared especially to first- and second-year undergraduate students, the facility and its resources are also widely used by upper-level undergraduates, graduate students, faculty, and staff, making the Clough Commons a true crossroads for academic enrichment and innovative learning. In fact, the Clough Commons sits at the geographic center and academic crossroads of Georgia Tech's campus. The Commons is a short walk from the Student Center and directly across from a large multipurpose classroom building. The facility is also physically connected to the library on two floors, and there is a flow of users between the library and the Commons 24 hours a day. Notably, the physical connection between the Clough Commons and the library is a significant contributor to the high use rate of both buildings. Since the Commons opened, library usage has increased by 15 percent, far exceeding the increase in student enrollment. It is not surprising that many students anecdotally refer to the 24-hour library/Clough Commons complex as their second home at Georgia Tech. To provide a user-centered view of the variety of ways the building serves students at all hours, Georgia Tech's Communications and Marketing Department

created a whimsical multimedia piece titled "24 Hours at Clough Commons" (see www.news.gatech.edu/features/24-hours-clough-commons).

Locating the Clough Commons at the center of the campus was a conscious decision by university planners. The removal of an existing parking deck was required in order to place the Commons in proximity to facilities already heavily used by all members of the Georgia Tech community, especially students. This strategy for site planning has contributed to a dynamic, vibrant user experience in both the library and Clough Commons spaces. Campuses seeking to create learning commons facilities may wish to assess their current spaces and potentially adopt a similar site location strategy.

LITERATURE REVIEW

Much of the primary research in recent years has focused on the topics of active learning, flipped classrooms, and technology as related to student engagement with peers, faculty, tools, and artifacts in the classroom. With the exception of a few studies, most research on informal spaces outside of the classroom captures an assessment of student preferences but a limited view of student experiences. Sociologists have coined the term "lived experience" to describe first-hand accounts and impressions of living. For this study, we aimed to develop an empathetic understanding of the lived experience of students in the Clough Commons, which required knowledge of five topic areas that influence experience: (1) the user experience, (2) the language of place and space, (3) the role of mobility and technology, (4) the value of community building, and (5) the effect of ambient noise.

THE USER EXPERIENCE

The role of the physical environment is increasingly important in the experiences of an “always on” community of learners (Baird and Fisher 2005), described as those who value tools and environments (content, virtual, physical) supportive of interactive, social, customizable, and on-demand learning pathways. Mobile and informational technologies are central to individual experiences, shifting our environment away from being a passive backdrop and toward becoming an active agent in organizing our daily lives and our communities (Crang and Graham 2007; Veinot and Williams 2012). Dede (2005) posits that virtual interfaces for ubiquitous computing have reshaped the way learners of all ages engage with the virtual and physical spaces around them. This includes increasing fluency in virtual settings, tacit and situated learning experiences, and personalized learning experiences. Dede (2005, p. 11) further suggests that shifts in learning styles and experiences will require planners to “create layered/blended/personalizable places rather than specialized locations (such as computer labs)” that support a variety of interactions and experiences.

The research of Battarbee (2004) focuses on user experiences within the context of social interactions or co-experience. Co-experience addresses aspects of individuals reflecting on their experiences and then sharing them with other individuals or groups who are also in that common environment. Based on the works of Wright, McCarthy, and Meekison (2003), McCarthy and Wright (2004), and Forlizzi and Ford (2000), Battarbee describes how users make sense of space. Battarbee explains that experience is comprised of four strands: sensory, emotional, spatio-temporal, and compositional. Specifically within the framework of the four strands, there are meaning-making activities (anticipating, connecting, interpreting, reflecting, appropriating, and recounting) that relate to the experiences. Battarbee (2004, p. 51) explains: “The strands describe elements of the being-in-the-moment kind of experience, the meaning-making aspects of how we connect the moment with the past and orient towards the

future.” Meaning-making activities are woven throughout the daily experiences of students in the Clough Commons. Activities described by Battarbee surfaced in the research that led to our development of use modes. Particularly pertinent to the research is the notion of being-in-the-moment experiences.

Redström’s (2006) research builds on the notions of user experience, time, and space. A historical perspective of use design provides us with an understanding of how physical space (form) and its intended use (function) relate; how the use of physical space “invites potential users to interpret its form” (p. 125) (thus space communicating with the user); and how this communication then moves the planner closer to thinking of the design of the space in terms of the user experience as opposed to focusing solely on the physical space itself. Redström suggests that there are underlying problems in designing physical spaces that place too much emphasis on the use of the space and what the user behavior should be like. Instead, Redström takes a more empathetic approach, suggesting that the process become more participatory. Further, Redström (2006, p. 136–37) questions what would happen “if we tried to make our design ask questions about use that were open for its users to answer, rather than thinking of the design as a way of providing well-defined answers from the start.” Finally, as noted throughout *Research on Learning Space Design: Present State, Future Directions* (Painter et al. 2013), researchers should “develop their research teams to include those from other disciplines who can help them design a replicable study, choose valid and reliable instruments for measuring outcomes, and select and execute appropriate data analyses” (p. 28). The methodology used for the Clough Commons research study reflects this type of systematic approach to appropriately assessing the user experience.

THE LANGUAGE OF PLACE AND SPACE

A review of the literature written on place and space illuminates the diverse language used to define the similarities and differences between the two terms. Brewer and Dourish (2008, p. 984) describe the distinction made by Harrison and Dourish (1996) as “a distinction between two accounts of spaces—a geometric account and an experiential account.” Other terms used in the literature to describe place, space, and the user relationship with both include nomadic space versus state space, smooth space versus striated space, and virtual versus physical space. Although the terms used to define place and space vary depending on the point of view of the authors, the concepts of social and cultural encounters serve as a common thread.

The work of Brewer and Dourish (2008, p. 965) suggests that we consider place as “our embodied experience of settings.” Places are settings that have relevance to us through physical considerations for social encounters and cultural meaning. By contrast, space provides a continuum of order and connectedness by which we move through our everyday lives. Space is how physical settings are connected and understood, providing an understanding of how to make sense of the environment around us. Brewer and Dourish (2008) discuss three themes that are directly connected to user experience and campus planning: legibility, literacy, and legitimacy. Legibility of place and space is critical to our understanding of how the place and/or space provide information for us, both socially and culturally. Spatial literacy refers to how we interpret the information provided by the environment around us, the activities we engage in, and the relevance of those activities. Brewer and Dourish (2008, p. 971) cite maps as an example of these “intersections of practice, knowledge, and representation.” Maps are described as ways of understanding, recording, and moving through space, which is an accurate description of spatial literacy. Legitimacy of place and space relates to how we seek information from, make sense of, and find relevance within the environment around us. Because individuals experience place and space

through different actions and perspectives, place and space are in a constant state of tension. The themes of legibility, literacy, and legitimacy of place and space were evident in the responses of Georgia Tech students participating in the digital ethnography study. These themes are important to consider in the planning of environments intended to guide an undergraduate cohort through the transitions of an academic experience.

Bayne (2004) and Savin-Baden (2008) explore the concept of space in the physical sense when describing smooth and striated cultural spaces. Referencing the work of Deleuze and Guattari (as cited in Savin-Baden 2008), smooth spaces are described as “nomadic;” that is, in a constant state of movement. These spaces are open, flexible, and owned by their inhabitants. Smooth spaces are where knowledge is contested and learning is co-created. They are messy and undisciplined, which often creates tension between stakeholders and users. Striated spaces, on the other hand, are described as bounded spaces. These spaces have an orientation that focuses primarily in one direction, reflecting the organizational and pedagogical structure of the space. Classrooms and lecture halls are examples of striated spaces. The Clough Commons encompasses attributes of both striated and smooth spaces; it has both nomadic and bound spaces.

Savin-Baden’s work incorporates the concepts of smooth and striated spaces into the broader scope of spatial ecology. Spatial ecology is defined as “the creation of balance between and across spaces in higher education, so that account is taken of not merely knowledge, content, conceptions and acquisition, but also of ontology, of values and beliefs, uncertainty and complexity” (Savin-Baden 2008, p. 16). In today’s immensely mobile world, the development of a sense of place, place identity (Mennecke et al. 2010), the connection of experience through interaction, the intersections between faculty and students, the legibility of space, and social and cultural interactions are all fundamental elements of spatial ecology.

THE ROLE OF MOBILITY AND TECHNOLOGY

Mobility plays a pivotal role in how communities are shaped and the interactions that shape them. Mitchell (2003, pp. 3–4) states, “Increasingly, we are living out our lives at the points where electronic information flows, mobile bodies, and physical places intersect in particularly useful and engaging ways. These points are becoming the occasions for a characteristic new architecture of the twenty-first century.”

Brewer and Dourish (2008) cite two aspects of mobile technologies that have affected community and created new opportunities for cultural encounters with space. First, wireless and mobile technologies have created a shift in the way people work, creating possibilities for spaces that are fluid and supporting the movement of people and the social and cultural activities that ensue (Weiser 1991). Second, there is a new interest in co-creating and collaborating in a variety of settings beyond the traditional work space, classroom, or other academic setting. These might include coffee shops, gallery spaces, and museums (Brown and Chalmers 2003; Heath et al. 2002; Hornecker and Buur 2006; Reeves et al. 2005).

Cresswell (2006) points out that mobility is not only about movement from point A to point B. Patterns of connection that emerge out of movement and mobility have long been part of our everyday life (Brewer and Dourish 2008).

Literature on urban studies provides a macro view of how migrations and patterns of movement have developed throughout history. Much of the literature on patterns of movement in urban environments focuses on streets and public spaces in cities. These are places where both similar and diverse elements intersect (Lynch 1960; Sennett 1977; Turnball 2000).

Specifically relevant to our work at the Clough Commons is research by Whyte (1980) on crowds in New York City’s parks and plazas. With the use of time-lapse cameras, Whyte spent three years observing and measuring the interactions

and activities of people within these public spaces. Whyte’s findings inform two areas of interest in our Clough Commons research. First, people want to sit in places that are physically and socially comfortable (Houstoun n.d.). Second is the notion of self-congestion. Although people often indicate that they prefer to get away from crowds (e.g., study alone), Whyte’s findings reveal the opposite: people attract other people. Many people prefer crowded spaces and carry on conversations in the middle of sidewalks (Houstoun n.d.; Whyte 1980). In the Clough Commons, students will study for hours in the middle of a busy, populated facility.

THE VALUE OF COMMUNITY BUILDING

Tinto and Goodsell (1994) describe the first-year experience as “a time of transition and adjustment to the social and academic demands of college, a time when the likelihood of dropout and the possibility of transformative learning is greatest” (p. 1). (See also Erickson and Strommer 1991; Tinto 1987; Upcraft and Gardner 1989.) Tinto and Goodsell point out that integrating academic and social engagement is important because providing opportunities for students to form smaller interest groups helps them balance the large-scale classroom dilemma, especially at large universities. Bauman (2001) and Connell (2003) suggest that a sense of community creates a sense of belonging, warmth, and security in which a highly complex society becomes more manageable and commonplace.

Key elements of a well-integrated community include information, communication, sense of place, and technologies. Information inputs and communication outputs help people make sense of and operate within a community (Veinot and Williams 2012). Place serves as a backdrop for community interactions and as context for establishing meaning and location for place-based symbols, which influence both “our understanding of community and . . . community life itself” (Veinot and Williams 2012, p. 855). (See also Gusfield 1975; Lofland 2003.) One of Georgia Tech’s

primary goals for the Clough Commons is to build a sense of community among first-year students.

THE EFFECT OF AMBIENT NOISE

There are many open spaces in the Clough Commons where students spend hours engaged in homework activities and studying, both independently and with others. Considering that there are over 700 seats within the Commons, ambient noise is a constant consideration in how students experience these spaces and the amount of control they have in managing that experience.

Extensive scholarly research involving cohorts of young children within a structured classroom environment has linked cognitive impairment and noise-related reading problems to the existence of background noise, providing evidence of a correlation between auditory distractions and academic performance (Evans and Maxwell 1997; Haines et al. 2001; Higgins et al. 2005; Schneider 2002).

Research from Beaman (2005) provides findings relevant to young adults in higher education. His research looked at the effect of low-intensity background noise on serial recall tasks, numerical processing, and prose processing. Most of Beaman's research took place within the work environment, though he points out that offices, education spaces, and safety-critical environments (e.g., air traffic control centers) can be loosely considered work environments. Beaman (2005) notes that while the spaces might have similar attributes, the occupants of the spaces vary greatly as do the activities going on within the spaces.

Beaman's review includes a study from Furnham and Bradley (1997) that suggests a connection between personality types (extravert/introvert) and levels of auditory distraction. Personality differences, Beaman reflects, have not played a major role in other investigations. Additionally, he suggests that more research is required beyond the work of Furnham and Bradley before any conclusions can be made.

Self-reporting perceptions of research participants, peaks of noise, predictability, and control are considerations that must be factored into the findings from research related to ambient noise and noise annoyance (Dockrell and Shield 2004; Higgins et al. 2005; Kjellberg et al. 1996; Stansfeld and Matheson 2003). These findings support caution in placing too much emphasis on the perceptions of participants because some might be more sensitive to external noises than others (Belojevic, Slepcevic, and Jakovljevic 2001; Zimmer and Ellermeier 1999). Participants might also not understand the effect of noise on their work (Knez and Hygge 2002; Salame and Wittersheim 1978). There are instances in which low-intensity background noises can have a positive effect on performance. One such finding comes from the aviation industry, in particular the cockpit of an airplane. A study by Pritchett and Hansman (1996) finds that the voice exchanges pilots hear between air-traffic controllers and other pilots helped many maintain awareness of their surroundings.

Additional findings related to the positive effect of noise on performance come from the research of Mehta, Zhu, and Cheema (2012). Focusing on the effect of ambient noise on creativity, this research provides support for the notion that “subtle cues in our physical environment can indeed affect human cognition and behavior” (p. 785). Within a theoretical background on noise and creativity, the researchers provide a context for understanding the definitions of noise, sound, white noise, pink noise, sound levels, and loudness. They argue that while there is substantial research examining the effects of noise on human cognition and behavior, the findings are inconclusive as there was no empirical evidence relating noise to creativity. The researchers conducted five experiments that generated data categorized into four groups: number of ideas generated, arousal level, difficulty processing (disfluency), and creativity of the ideas generated. As a result of the experiments, the researchers were able to demonstrate a correlation between ambient noise and creativity. The findings indicate that moderate (vs. low) levels of ambient noise disrupt information processing, which leads to abstract cognition and enhances creativity (Mehta, Zhu, and Cheema

2012). A high level of noise, however, impairs creativity by reducing the extent of processing.

It should be noted that the context for this research was consumer based. To create a blend of constantly varying background noises that most reflects consumer context, a soundtrack was developed that blended “multi-talker noise in a cafeteria, roadside traffic, and distant construction” (p. 786). This soundtrack might well represent the background noises people experience in a learning commons on a college or university campus. Although this research is limited in scope and was not performed within the framework of higher education, it does provide insight into the noise-creativity relationship and invites further research.

The research outlined in the review of literature on ambient noise suggests that there is no one factor that influences the relationship between noise, human cognition, and behavior. Planners must consider and understand the cohort exposed to the noise, the environment and its physical cues, the activities and cognitive tasks in the environment, and the kinds of noise (e.g., high level, short duration versus low-intensity background) in the environment.

SUMMARY

After reviewing the literature on (1) the user experience, (2) the language of place and space, (3) the role of mobility and technology, (4) the value of community building, and (5) the effect of ambient noise, we see clear connections between the effect of physical space on student behavior and the success of any learning commons environment.

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PURPOSE OF THE STUDY

The purpose of our study was to develop an empathetic understanding of the lived experience of students in the Clough Commons through the recording of the activities and behaviors that influence experience, as well as to provide a list of considerations for the spatial design of learning environments that encourage student engagement and interaction resulting in better learning experiences.

METHODOLOGY

Initial meetings between the Georgia Tech Library User Experience and Herman Miller Insight and Exploration teams included physical tours of the Clough Commons as well as one-on-one interviews with building stakeholders who were instrumental in the design, construction, and programming of the facility. A small group of representatives from the staffs of the library’s Research, Instruction and Outreach Services and User Experience Departments; a member of the Georgia Tech Office of Assessment; and members of the Herman Miller Insight and Exploration team met to discuss the objectives of the research and, ultimately, to formulate research questions. These research questions were used to help gain insight into the lived experience of the students:

- » What is working and not working in terms of enhancing the student learning experience (getting the students to interact and engage)?
- » Where are the users of the building spending their time, how are they navigating, how long are they there, what is the reason they come there, and how frequently did they come?
- » Into what kinds of settings are the students coming? Are they working in groups, are they independently focused (i.e., “alone together”), or are they working as individuals?

- » What are the struggles and pain points? What are the work-arounds they perform to adapt the space to fit their needs?

RECRUITMENT AND PARTICIPANTS

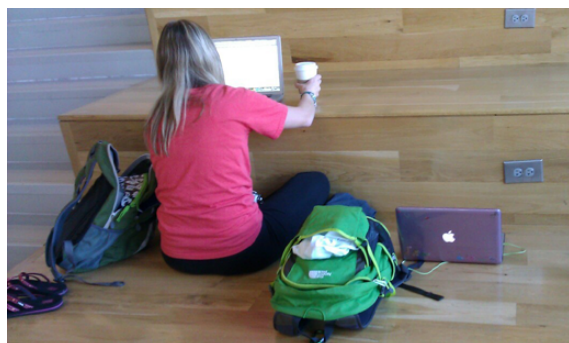
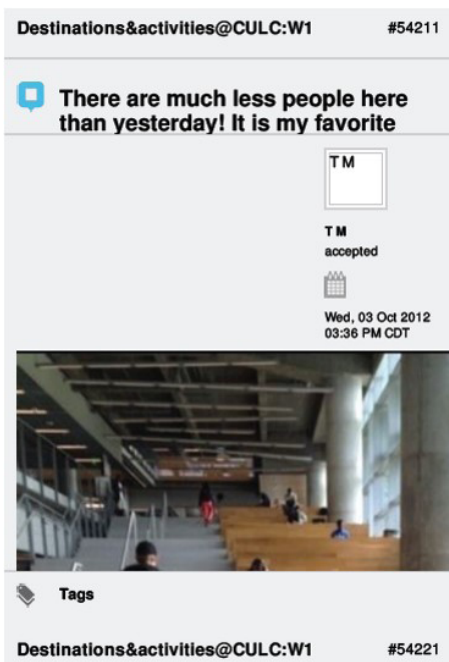
After developing our research questions and possible tools for investigation, we submitted a research proposal to the Georgia Tech Institutional Review Board (IRB). It is important to note that for any type of research that involves “protected classes” of individuals, such as minors or, in this case, college students, formal approval by an institution’s IRB is required. Including the Office of Assessment in this process was critical since it was able to weight the sample based on gender, major, and year in school and also mediate IRB issues related to partnering with a non-Georgia Tech entity to conduct the research.

Student participation in the study was voluntary and incentivized with gift cards awarded to all volunteers who successfully completed the research requirements. Invitations to participate were e-mailed to a stratified random sample of undergraduate students. Thirty-six students participated in the study.

DATA COLLECTION

The application of a multidimensional methodology involving qualitative and ethnographic approaches was appropriate for developing a more holistic and statistically valid theory of the types of behaviors and use modes occurring in the Clough Commons. In order to uncover apparent and latent modes of behavior and usage, a user-centered approach was taken. Specifically, our research methods involved (1) digital ethnography, (2) observations and walk-up interviews, and (3) desk research and occupancy maps (data from social media and analysis of existing building research data and statistics).

- » **DIGITAL ETHNOGRAPHY.** Since one goal of the study was to uncover the lived experience of students using the Clough Commons, we attempted to find tools and methodologies that could capture data unobtrusively and in real time. This approach differs from the reflective surveys of focus groups, which, although useful for some research, suffer from the perils of memory lapses and groupthink. The mobile ethnography tool best suited to this type of research is called dScout. The dScout software is a user research tool that, according to the dScout website, helps users to “[share] real-world experiences, in the moment ideas and real-time feedback” (dScout n.d., ¶ 1). The tool is available as an app for smartphones (iPhone and Android) and tablet devices and is also accessible via the web. With this tool, “scouts” (student volunteers) engaged in “missions” (research assignments) and submitted at least 10 “snippets” (posts) to the dScout app. Posts consisted of both narrative comments about the activities students were engaging in as well as photos of the spaces in which they were working and the items, such as computers and books, they had with them. The dScout digital ethnography tool provided both narrative details and compelling visuals that captured the activities, enablers, and barriers that created authentic lived experiences in the Clough Commons (figures 1 and 2).
- » **OBSERVATIONS AND WALK-UP INTERVIEWS.** In addition to the snippets submitted by dScout volunteers, Herman Miller researchers observed a mix of spaces in the Clough Commons at various times of the day and on different days of the week three times during the semester. This was critical to understanding how students shifted their use of the space over different times. To supplement the observations, Herman Miller researchers performed intercept interviews to further uncover unique or unconventional uses of the space.

Figure 1 **Example of Student Activity Captured With dScout**Figure 2 **Sample dScout Data Snippet**

Note: Data was collected from 36 scouts and included 781 snippets.

- » **DESK RESEARCH AND OCCUPANCY MAPS.** The Georgia Tech Library and Georgia Tech Office of Assessment staffs provided a great deal of data regarding Clough Commons usage since its opening in August 2011. These data points included gate counts organized by time of day and day of week, number of special events, statistics regarding tutoring usage, Core Info desk statistics, details of technology support requests, and group study room utilization data. In addition, the undergraduate programming and engagement librarian developed heat maps to quantify occupancy floor by floor during multiple times of the day; these maps were also integrated into the data analysis.

ANALYSIS

Analysis of the data involved a series of collaborative sessions in which the data were organized, sorted, clustered, and re-clustered as we explored evolving themes and patterns. We organized 781 photographs from dScout missions accompanied by 781 narrative details describing scouts' activities in the Clough Commons. We read, coded, and analyzed notes from 62 hours of observations and transcripts from 39 interviews in preparation for clustering activities.

The first insight-sorting session involved clustering individual photos depicting similar activities. For each of the clusters, we developed an insight statement, which led to discussions and shared understandings about why the photographs were grouped as they were. In a few instances, discussions led to re-clustering. The clusters were photographed and saved for future reference.

Our second session focused on sorting and clustering the scouts' narratives. Leveraging the insight statements from the first session, we looked for patterns and themes in the narratives. We also looked for outliers, those narratives that did not fit within our existing activity themes. From the patterns found within the activity themes, we began to develop a snapshot of a typical day in the life of a student in the Clough Commons. Further analysis led to student-user identities, as seen in figure 3. Additional activities in this session included examining patterns and clusters through the lens of observational insights and occupancy heat maps. In mapping our scouts' journeys using various sets of data, we discovered that students often fluctuate in their behaviors, jumping from one identity to another based on their mindset and motivations at any given moment.

A prelude to a third session involved matching the user types to the activity descriptions supplied by the student scouts. A critical component in our analysis was to continually connect our insights directly to the voices of the student scouts. In

our third analysis session, two additional researchers were invited in order to bring a fresh perspective to the review of our insights. As a result of the review and the discussions that followed, we were encouraged to reframe our insights from user identities (figure 3) to use modes based on research goals and outcomes.

Figure 3 **Examples of Student User Identities Generated by Clustering Narratives of Digital Ethnography Data**

Typical Users	Users were in the Clough Commons 9:00 AM–5:00 PM, attending classes, meetings, study sessions, and labs
Night Bats	In addition to a workday in the Clough Commons, users returned after the dinner hour and studied, did homework, or worked on projects together in groups of two or more
Night Owls	Users are just like the Night Bats except they studied alone while together in a group
Residents	Users who viewed the Clough Commons as a home base
Grab n' Go	Users who came into the Clough Commons for a specific purpose, took care of business, and left
Transients	Users who passed through the Clough Commons on their way to another building for class or activities
Tour Guides	Users who might bring their parents in for a tour, students who serve as campus tour guides for prospective students and parents, as well as community and corporate visitors

In the fourth session, we described the user activities and behaviors in terms of use modes. This led to a deeper distillation of the themes, use modes, and insights to uncover opportunities for continuous improvement in how the environment serves student engagement and interaction and to leverage insights informing future planning. Results of the synthesis identified specific design elements that correlated with the use modes. The design elements and corresponding attributes provided an understanding of how design interventions might improve the student learning experience. In order to frame our design recommendations for improvements to the Clough Commons, we crafted four

questions by which the user activities and behaviors were evaluated: (1) What is the Theme? (2) What is the Use Mode? (3) How does this enhance learning? and, most importantly, (4) What can we do about it?

RESULTS

Meeting the first of our research objectives—to outline an empathetic sense of the lived experience of student users within the Clough Commons—required analysis that led us to identify 11 use modes for students in the Commons. The use modes helped us understand the distinct mindsets and behaviors of the students while they are in the Commons. Each mode is outlined below.

(1) ALONE TOGETHER

This use mode reflects a frequently observed behavior in the Commons: working individually while surrounded by others and ambient traffic (figure 4). This behavior is consistent with previous research in the Library East Commons and the 2nd floor of the West Commons of the Georgia Tech Library (Fox and Doshi 2013). Students in this use mode often have headphones on. Based on the data, this use mode is a longer-term behavior; users tend to stay in the Alone Together mode for longer periods of time as compared to other modes.

(2) ESCAPE

This mode describes individuals who are getting away from their work and taking a break. The roof garden at the Clough Commons is viewed by students as a treasured respite from the rigors of academic work happening within the facility. A review of student tweets from 2011–2013 revealed that the roof garden was the most popular area during that time. In addition, pop-up concerts, which are brief 15-minute teaser performances of events happening elsewhere on campus, were mentioned by students as pleasant moments of Escape. Perhaps moments of Escape might also be opportunities to

Figure 4 **Scout Snippet of the 4th Floor with Comment: “Still find it easier to focus in the library, but the energy in the Commons keeps me awake!”**



inspire students through nature, as with the roof garden, or arts and culture, as with the pop-up concerts.

(3) HACK AND SETTLE

We discovered that even with 220,000 square feet of new space, students still feel the need to demarcate their territory and settle in for long periods of time. This mode involves finding a comfortable spot, usually close to electricity, and taking control of the space by creating some type of visual or physical barrier. In one area of the Clough Commons adjacent to the library, students regularly arranged mobile whiteboards to block off the café booths in order to take a nap. Hack and Settle can involve groups or individuals.

(4) MEET UP

The Clough Commons is both a scholarly community center at Georgia Tech and the geographic center of campus. It links the East and West Campuses and, as a result, is an ideal location to meet. These encounters include student-faculty

interactions, meetings with graduate teaching assistants, and meetings among students sharing a common interest.

(5) TRANSIENT

The Transient use mode reflects the behavior of moving through the Commons, occasionally making multiple stops for coffee, water, and printing services, and of moving from destination to destination, using the Commons as a thoroughfare between two buildings with quick stops or breaks in the facility. Transient movement occurs with individuals and in small and large groups.

(6) PASSING THROUGH

Passing Through is differentiated from Transient because there is no intention of stopping in the Clough Commons. Instead, the building is used simply as a convenient thoroughfare from one part of campus to another.

(7) GRAB N' GO

Many students enter the Clough Commons to accomplish a single task. For example, the Commons tutoring space offers drop-in services for a variety of undergraduate courses. Statistics show that students use these academic support services very actively, and the data from the research study suggest that the Grab n' Go use mode is, in part, due to these academic supports.

(8) SEEK

The Seek and Grab n' Go modes are related. However, Seek is more about searching and does not involve a predetermined destination or item, which is a characteristic of Grab n' Go. A student may, for example, be wondering about possible undergraduate research opportunities but not have a specific destination or person to meet with in mind. Seek might involve getting further information about a topic in the Office of Academic Enrichment.

More often, Seek is defined by the intentional search for an ideal study space. Notably, students did not feel comfortable approaching an individual seated at a four-plus-person desk and asking to sit down. Often the dScout snippets that reflected a sense of congestion in the Clough Commons resulted from the assumption that if one person is seated at a four- to six-person table, then that entire table is unavailable. This use mode is thus related to Hack and Settle, since students feel the need to claim space, particularly during busy times in the semester.

(9) WAIT AND ANTICIPATE

This is a typical use mode in the Commons due to the number of classes and labs in the building. Since every first-year student will take at least one class in the Commons, there are many times when students are waiting for class to begin, typically in hallways or areas in proximity to classrooms/labs (figure 5). Of all the use modes, Wait and Anticipate offers the greatest possibility for maximizing idle periods of time in the Clough Commons. Many forward-thinking workplaces attempt to offer spaces for brainstorming in hallways and outside of destination points (for example, writable glass or whiteboards). In our research study, users noted that digital signs displaying upcoming academic and cultural events were helpful distractions while waiting.

(10) DISCOVER

Students, faculty, and administrators hoped that the Clough Commons would create opportunities for undergraduate students to discover new concepts, ideas, and people through regular serendipitous encounters with others from a variety of cultures, disciplines, and regions. Discover was certainly evident in our data. For the past three years, the Clough Commons has hosted a highly popular art crawl. This example of a serendipitous encounter with arts and culture lifts the Clough Commons experience above and beyond a purely academic one. The building becomes a place for discovery.

Figure 5 **Scout Snippet with Comment:** “Getting to lab early allows me to talk to my friends and have a little down time.”



(11) EXPLORE

Particularly evident among new students during the early part of the semester, Explore is characterized by looking at the Clough Commons with fresh eyes and being open to new possibilities and experiences. In this mode, students are exploring the variety of spaces and furniture styles, and they are interpreting the cultural norms of the Commons.

SUMMARY AND DESIGN RECOMMENDATIONS

Figure 6 presents a visual narrative of how this project helps us understand student engagement and the lived experience within the Clough Commons.

Reviewing literature that discussed user experience, place and space, mobility and technology, community building, and ambient noise helped us formulate the research questions that would give us insight into the lived experience of students. Observations and data built on previous learnings and provided new ones. For example, articles on the value

of community building and observation of how students work and spend their time in the Clough Commons led to the identification of Co-Experiences, which describe how students share physical space. Sensory Inputs were informed through research findings on ambient noise (among other topics) and inquiry into the effect of physical space on physical and emotional responses. Activities were synthesized to discover and define 11 distinct use modes. Finally, our design recommendations align with one or more of the five lived experiences shown in figure 6: Co-Experiences, Sensory Inputs, Mobility, Destinations, and Activities.

DESIGN RECOMMENDATIONS

Based on the insights discovered in our analysis and synthesis sessions, we developed a collection of recommendations we termed Design Elements. Design Elements are directly related to habits and behaviors self-

reported by student scouts or observed by researchers. These recommendations represent opportunities to elevate the relationship between the spaces within the Clough Commons and the user experience.

- » INITIATE THE NEW AND DIFFERENT. An important element of the learning experience framed by Co-Experiences at the Clough Commons is the opportunity for interactions and connections between student peers and students and faculty. As a result of the “always on” mobility of Georgia Tech students, work patterns and study habits tend to develop throughout their daily lives. Promoting activities that are unexpected provides opportunities for new relationships to develop, new happenings to take place, and unexpected encounters with peers, faculty, and artifacts within the building (figure 7).

Figure 6 **Visual Narrative of the Lived Experience of Student Users at the Clough Commons**

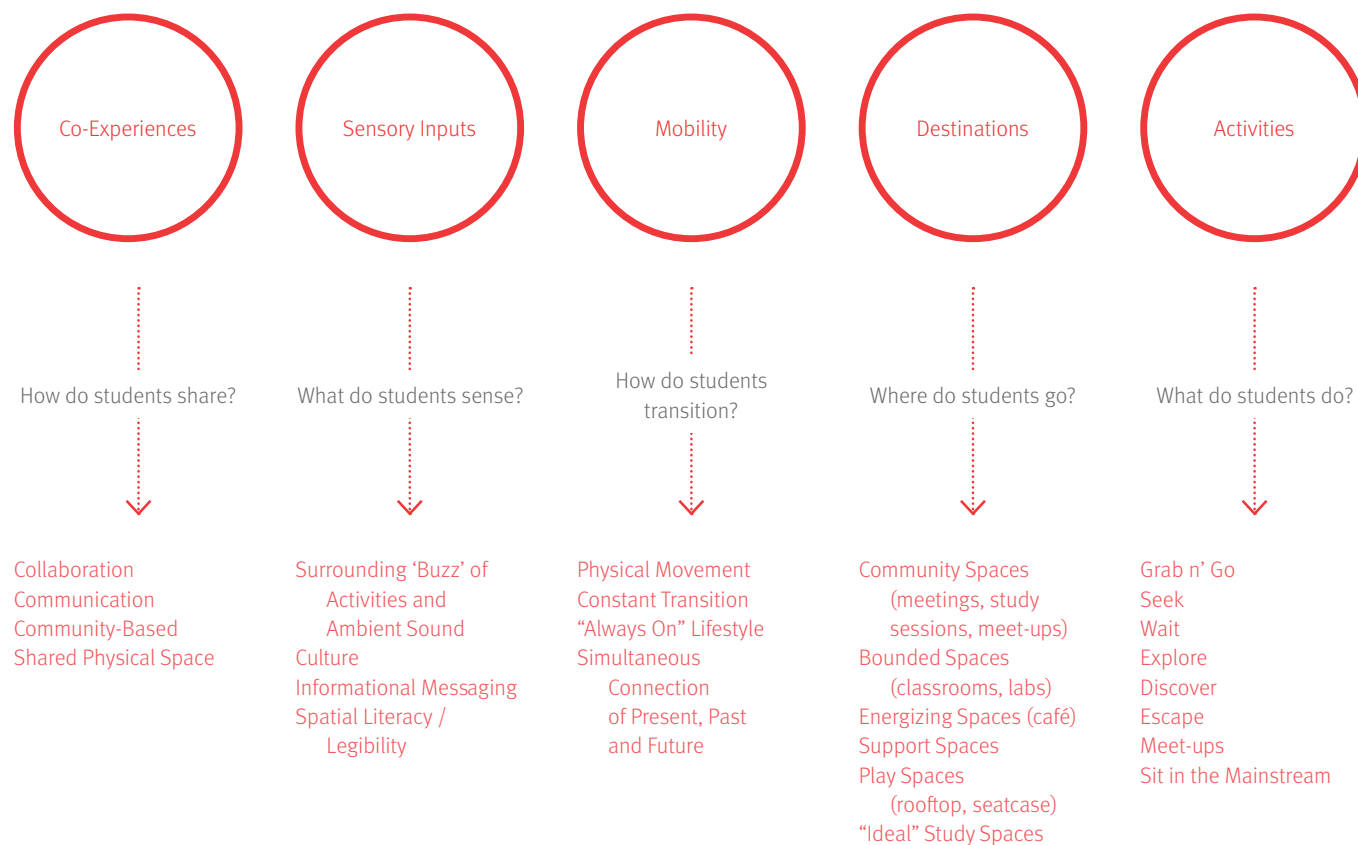


Figure 7 An Unexpected Dance Demonstration Encourages Students to Discover Something New

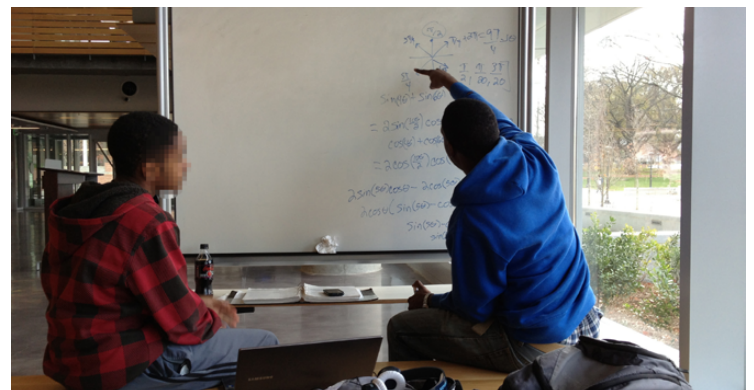


- » **CREATE ANCHOR POINTS THAT SERVE AS HUBS.** Anchor points provide greater visibility of people and space while communicating to users a sense of what is happening around them. Anchor points serve as go-to places for students looking to meet with peers and provide spatial legibility for new users in the building.
- » **BUILD IN RECESS.** One of the foundational goals of the Clough Commons is to build a community of learners within the first-year student experience. As a result, first-year students spend a good deal of time in class and studying within the Commons. We observed that students needed a break from their academic work without leaving the building, often for only a brief period of time. Building in an acceptance of the notion of recess by providing spaces where users can choose to go without a specific reason offers a release from the pressures of the collegiate experience.
- » **ALLOW FOR MULTIPLE PROXIMITY SETTINGS BY THE USER.** No two users occupy a space in the same way. Placing control of the artifacts and tools in the space with the user provides comfort, ownership, and a sense of security.
- » **ACCOMMODATE MULTIPLE FORMATIONS OF PEOPLE, OBJECTS, AND ENVIRONMENTS.** As students set about organizing their daily lives into meaning-making activities, providing a variety of opportunities in the

form of physical space, tools, and artifacts sets the tone for user interactions and relationships.

- » **DESIGN GUIDED EXPERIENCES.** Students spend a great deal of time in the Clough Commons waiting for classes, labs, and other events to start. Providing guided experiences throughout the building converts this time into useful activities where new knowledge and information might be explored and discovered.
- » **USE DESIGN CUES TO HELP USERS NAVIGATE AND INTERACT.** This Design Element amplifies wayfinding by helping students find destinations that fit their specific needs and interpret information and messaging about the environment. Students are in a state of constant transition, and these design cues provide spatial legibility and legitimacy.
- » **ALLOW IMPROVISATION WHEN IN GROUPS.** In preparation for a specific task or a collection of tasks, students go through the mental and physical process of creating an environment that meets their needs (figure 8). This process sets the stage for collaboration and community building.
- » **MAKE SURE ONE HAS WHAT ONE NEEDS.** As students are constantly on the move in the Clough Commons, this Design Element eliminates the unnecessary worry and chaos of trying to remember the location of tools or resources that support their learning experiences.

Figure 8 Students Move Mobile Whiteboards to Create a Hack and Settle Environment



CONCLUSION

Understanding the influence of the physical environment on student experiences outside of the classroom is critical for both higher education institutions and designers in order to enhance the learning experience. Our aim was to illuminate the experiences of students within Georgia Tech's Clough Commons by defining modes of use and the lived experience through a visual narrative. Our design recommendations offer ideas for enhancing learning and reflect our observations as well as student scouts' snippets. Our results are intended to provide broader insight into other learning environments as well as emphasize the importance of a research-based and user-centered approach to the design of all learning environments.

This research is particularly significant during this period of rapid transformation in higher education. As many college and university libraries aim to redefine their spaces away from primarily housing print collections and expand the

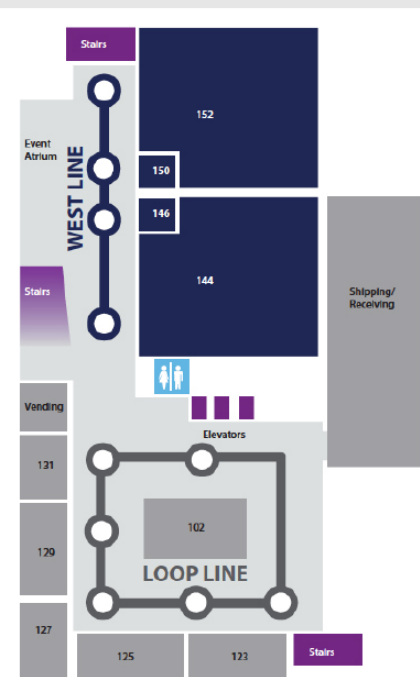
availability of student study and commons environments, these user research techniques may be useful and timely. Further, this research demonstrates that partnerships between universities and private firms can be successful if both parties recognize the importance of adhering to IRB regulations and engaging campus experts in the process. Finally, this research study demonstrates that this type of work is both an art and a science. There is no best practice that will lead to the ideal outcome. Instead, our experience suggests that the thoughtful application of tools and a rigorous (but not rigid) methodology will lead to conditions optimal for shared discovery. That shared discovery occurs in discrete moments of insight, leading to new questions and exciting opportunities for further engagement with users.

Our experience suggests that the thoughtful application of tools and a rigorous (but not rigid) methodology will lead to conditions optimal for shared discovery.

APPENDIX

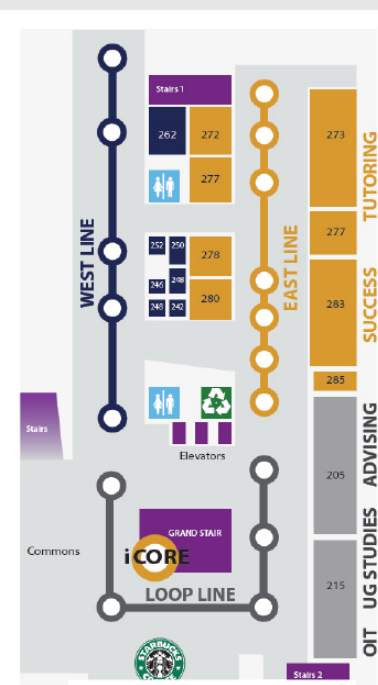
The five Clough Commons floor plans are presented below with descriptions of each of the five floors in order to provide a sense of the variety of spaces and academic support services in the building.

First Floor



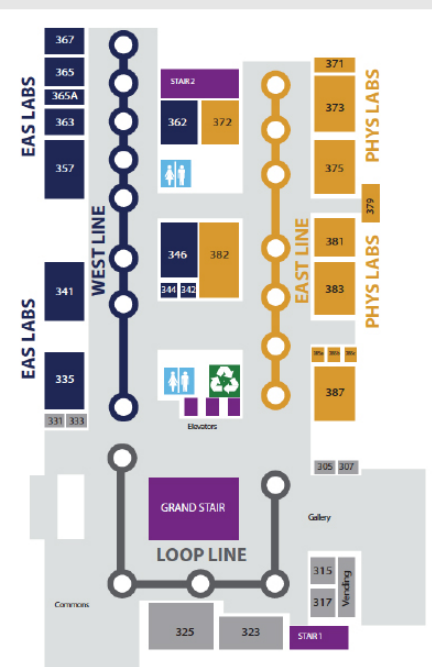
- » Two 330-seat auditoria used for large lecture-style courses, as well as high-profile campus speakers and events (a number of Nobel laureates, for example, have spoken in these spaces).
- » SCALE-UP classrooms.
- » 70-person classrooms outfitted with distance education technology (including technology support for distance courses).
- » Smaller classrooms for 10 to 15 persons.
- » Breakout spaces for small student group meetings (can be reserved 24-7 online).
- » Eight “Lincoln-style” armchairs for individuals.
- » Restrooms with showers to encourage “green” commuting.
- » Connecting the first and second floors are stairs made of recycled aluminum by-product. Adjacent to these traditional stairs is large wooden-step seating with outlets on each step. This wooden “seat-case” (as opposed to staircase) is flooded with natural light and has easy access to electrical outlets. It is a popular anchor point.

Second Floor



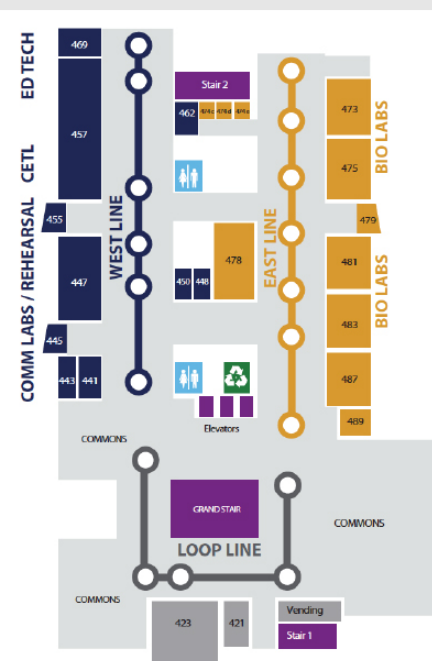
- » Additional classrooms (including SCALE-UP) and breakout rooms.
- » Commons seating in a variety of formats and arrangements, including whiteboards.
- » Clough Commons Core Info desk, which provides walk-up general advising and assistance with reserving rooms and answering general questions about the Clough Commons and Georgia Tech.
- » Highly popular Starbucks café, which is another anchor point for Clough Commons users.
- » Walk-in tutoring (one-to-one and small group) for computer science, chemistry, physics, calculus, and other disciplines.
- » Undergraduate Research and Innovation office, which connects undergraduate students with faculty researchers and also helps to incubate undergraduate start-up efforts.
- » Fellowships office, which helps Georgia Tech students develop competitive applications for awards such as Fulbright, Rhodes, and Marshall.
- » Technology Support Center (TSC), which is available to assist all users with hardware and software issues 24-7. In addition, the TSC has a space that allows users to test out new computers and mobile devices to determine which one may be a good fit for their needs.

Third Floor



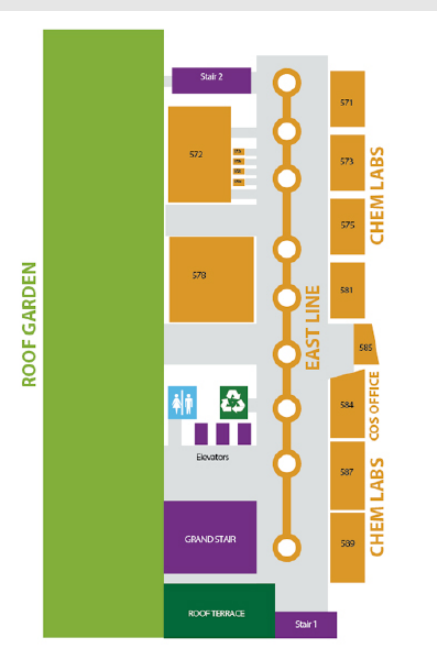
- » First-year laboratories for physics and earth and atmospheric sciences.
- » Gallery space.
- » Booth-style seating for small groups.
- » Access to the library ground floor (site of the Library Multimedia Studio).
- » Classrooms, breakout rooms, and variety of commons spaces.

Fourth Floor



- » Main connection crossover to Georgia Tech Library.
- » First-year biology labs.
- » Lots of commons seating, including waist-height Parsons tables.
- » Classrooms, breakout rooms, and variety of commons spaces.
- » Communications Center (aka CommLab), where students can gain holistic communications competencies from trained professionals for written, oral, visual, electronic and non-verbal (WOVEN) modes of communication.
- » The Center for Enhancement of Teaching and Learning (CETL), which aims to promote increased engagement between faculty and students and develop new pedagogical best practices at Georgia Tech.
- » Four presentation rehearsal studios. This concept was initially prototyped in the Georgia Tech Library and met with great success. As group presentations become the norm, particularly within the undergraduate curriculum, these technologically rich studios are vital to providing a space for students to practice and improve their group presentations.

Fifth Floor



- » First-year chemistry labs.
- » Small breakout rooms for 4 to 6 persons.
- » Access to roof garden, which includes Wi-Fi, electrical outlets, and seating for groups and individuals. The garden has been the site of many special events, including fund-raising and development events.

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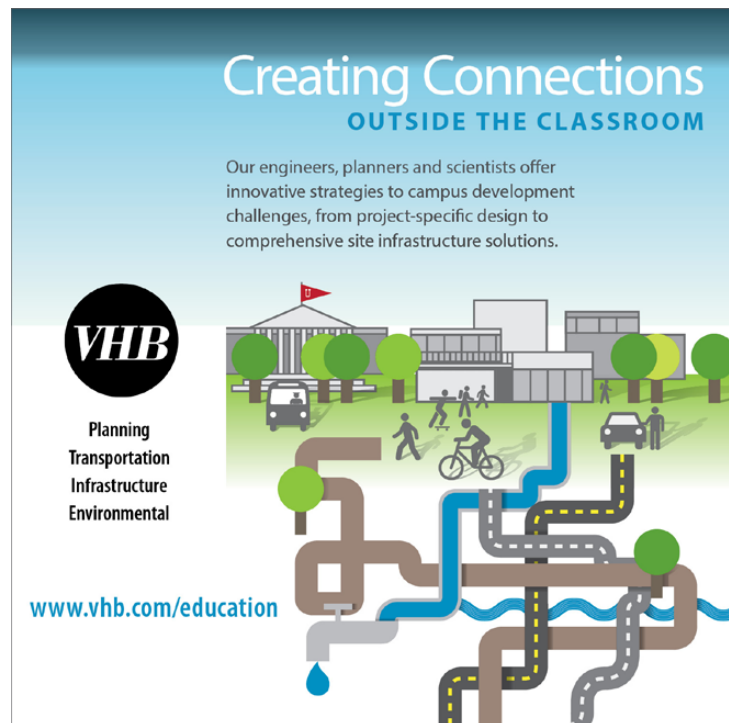
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- » at the right time and
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SPEAK THEIR LANGUAGE: Create and use a common planning vocabulary for communicating.

KNOW HOW TO MANAGE A PLANNING PROCESS: Facilitate an integrated planning process and manage change.

PRODUCE A SHARED PLAN: Produce an integrated plan that can be implemented and evaluated.

READ THE PLANNING CONTEXT: Collect and filter relevant information.

GATHER AND DEPLOY RESOURCES: Identify alternative and realistic resource strategies.